Amendments to the Specification

IN THE WRITTEN DESCRIPTION

Please replace the paragraph beginning at page 7, line 30, with the following rewritten paragraph:

At discrete intervals along the nitro-cellulose membrane 24 drug-protein derivatives are biochemically bound to the nitro-cellulose membrane, producing an immobile test zone of drug-protein derivative which spans the width of the nitro-cellulose membrane. Towards the extreme downstream end of the nitro-cellulose member, downstream of all the immobile drug-protein derivative test zones, is a control zone which also spans the width of the nitro-cellulose membrane. The test zones and control zone are interposed between background zones where the nitrocellulose membrane 24 does not have bound drug conjugate but has been blocked by other protein or other substances to prevent non-specific binding. Antibodies to each drug which is to be tested for, conjugated with colloidal gold, are placed on the conjugate release pad 27. When saliva is transferred from the swab in the presence of a run-fluid, the resulting sample passes across the absorbent sample pad 26 and across the conjugate release pad 27 where it mixes with the antibody-gold conjugates. The sample then travels the length of the nitro-cellulose membrane 24.

Please replace the paragraph beginning at page 8, line 16, with the following rewritten paragraph:

If the particular drug is present in the sample it will bind to the antibody-gold conjugate. When the bound drug subsequently passes over the specific drug-protein derivative test zone the antibody-gold conjugate has already been bound to the drug in the sample and is not free to bind with the drug-protein derivative bonded to the membrane. If the particular drug is absent from the sample, the antibody-gold conjugate will be free to bind to the drug-protein conjugate at the specific test zone causing the antibody-gold conjugate

to become immobilised at the site of the drug-protein conjugate. The visible marker is deposited in the test zone as a coloured line or stripe. In between these two extremes some of the antibody-gold conjugate will bind with the drug-protein derivatives at the test zone on the strip creating an intermediate intensity of colour. The intensity of the colour on the particular drug-protein test zone is therefore inversely proportional to the amount of drug present in the sample.

Please replace the paragraph beginning at page 8, line 31, with the following rewritten paragraph:

The depth of colour of the control zone should always be significant and the control zone is designed with this in mind. The colour of the control zone can then be used to indicate that the assay test has been successfully run and to threshold colour levels in specific drug conjugate test zones.

Please replace the paragraph beginning at page 9, line 20, with the following rewritten paragraph:

The receiving section includes a receiving bracket 32 and a microswitch 43 and also positions and supports a half silvered mirror 40 which forms part of the imaging section. The receiving bracket 32 has a back 38 and two parallel arms 36. The back 38 is connected at either end to one end of each arm forming a U-shaped bracket. The open end of the U-shaped receiving bracket 32 is directed outwardly from the screening device 30 and is aligned with an opening in one side of the cover (not shown) towards the rear of the screening device 30. The opening is large enough to allow a test cartridge 10 to be inserted into the bracket 32 of the screening device 30. The arms 36 of the receiving bracket 32 are spaced apart by a distance equal to the width of the test cartridge 10 and have the same longitudinal length as that of the elongate tray 18 of the test cartridge 10. The arms 36 have a C-shaped cross-section. When a test cartridge is inserted into the opening

the ridges 20 on the test cartridge 10 ~~mesh~~ engage with the C-shaped cross-section of the arms 36 of the receiving bracket 32 to direct the test cartridge into the screening device 30. The test cartridge 10 is slidably inserted into the arms 36 of the bracket of the screening device 30 until the end of the test cartridge reaches the back 38 of the receiving bracket when pressure against further insertion will be felt.

Please replace the paragraph beginning at page 10, line 8, with the following rewritten paragraph:

A half silvered mirror 40, which forms part of the imaging section of the screening device, is supported above the window 22 of the test cartridge 10 by a column 42 extending upwardly from the outer arm 36 of the receiving bracket 32 nearest the rear of the screening device 30.

Please replace the paragraph beginning at page 10, line 28, with the following rewritten paragraph:

A microswitch 43 is supported above the test cartridge 10 from the inner arm 36 of the receiving bracket 32 nearest the CCD 34. When a test cartridge 10 is fully inserted into the screening device 30 the microswitch 43 is displaced vertically causing an electrical signal to be emitted from the microswitch to signal that the correct insertion of a test cartridge 10 has been detected. During screening of the test cartridge 10, the microswitch 43 may resist any displacement of the test cartridge 10 once it has been fully inserted into the screening device.

Please replace the paragraph beginning at page 11, line 4, with the following rewritten paragraph:

The imaging section includes illuminating means, photosensitive detector means, means for representing the intensity of the detected light by a data array, data processing means for segmenting the data and comparing the segmented data and output means. The illuminating means is

provided by three light emitting devices (LEDs) 44 which are mounted in a horizontal line parallel to the longitudinal length of the test cartridge 10 with the middle LED centred vertically above the centre of window 22 of the test cartridge 10. The photosensitive detector means and means for representing the intensity of the detected light by a data array are provided by the ~~a~~ CCD 34 which includes an imager 82, a video digitiser 84 and a video data interface 86 (shown on Figure 5). Alternatively, the photosensitive detector means may be made up from a CCD array device together with a control and data conversion interface. The imager of the CCD 34 is directed towards the rear of the screening device 30. A mounting plate 46 is attached to the upper body of the CCD 34 towards the front of the screening device 30. The mounting plate 46 extends horizontally from the body of the CCD 34 towards the rear of the screening device 30 and finishes directly above the window 22 of the test cartridge 10. Three LEDs 44 are attached in a row at the front of the underside of the mounting plate 46. When illuminated, the light from the LEDs 44 shines directly onto the window 22 of the test cartridge 10. The mirror 40 is inclined from the vertical by approximately 35° such that the window 22 of the test cartridge is reflected into the field of view of the CCD 34. Light reflected from the immunoassay test is detected by an array of photosensitive detectors in the imager 82. The photosensitive detectors emit an electrical signal proportional to the intensity, the concentration, of light detected. The video digitiser 84 scans each of the photosensitive detectors in turn, converting the analogue data to digital data and storing the data in an array. The array of digital data is subsequently outputted to a central processor unit (CPU) 80 via the video data interface 86.

Please replace the paragraph beginning at page 12, line 5, with the following rewritten paragraph:

Rechargeable batteries 48 supply power to the CCD 34, LEDs 44, microswitch 43 and electrical circuitry 50. The rechargeable batteries 48 are positioned towards the front of the imaging section below the CCD 34. The electrical circuitry 50 which forms the final part of the imaging section is described later with reference to Figure 4 and Figure 7.

Please replace the paragraph beginning at page 12, line 11, with the following rewritten paragraph:

At the front of the screening device 30 is the display section including two test indicator LEDs 52 and 54, a liquid crystal display device (LCD) 56, operating buttons 58 and 60 and a front plate 62. The front plate 62 is slightly smaller than the facia cover and is located at the front of the screening device 30 directly behind the facia cover. The two test indicator LEDs 52 and 54 are mounted at the top of the rear of the front plate with the LEDs 52 and 54 protruding above the level of the front plate 62. Holes in the top of the cover at its front corner allow the test indicator LEDs 52 and 54 to protrude through the cover such that they are visible on top of the device.

Please replace the paragraph beginning at page 12, line 23, with the following rewritten paragraph:

The ~~An~~ LCD 56 and its associated backlight driver 94 are mounted at the top of the front plate 62 between the front plate 62 and the facia cover. The facia cover has a window through which the LCD 56 is visible but which obscures the backlight driver 94, located behind the LCD 56, from view. Also mounted onto the front plate 62 between the facia cover and the front plate are the two operating buttons 58 and 60. The facia cover has holes in corresponding locations to allow the user to operate the buttons 58 and 60 through the facia cover.

Please replace the paragraph beginning at page 13, line 8, with the following rewritten paragraph:

Figure 5 shows a block diagram of the electrical components of the screening device 30. The screening device 30 is based around a microprocessor or central processor unit (CPU) ~~30~~ 80 and the CCD 34. The CCD 34 comprises the ~~an~~ imager 82, and associated video digitiser 84 and video data interface 86. The screening device may also includes a keypad 88 or may be operated via a combination of buttons provided on the facia. The screening device also includes electrically erasable read only memory (EEPROM) 90, dynamic random access memory (RAM) 92 and the liquid crystal display (LCD) 56. The EEPROM 90, RAM 92 and LCD 56 are connected to the CPU 80. Alternatively, the EEPROM and RAM may be internal to the CPU. The LCD 56 may be backlit and control is provided via a backlight driver 94 which is connected to both the CPU 80 and the LCD 56.

Please replace the paragraph beginning at page 13, line 23, with the following rewritten paragraph:

The keypad 88 may be used to allow a user to enter data required by the CPU 80 to control operation of the screening device. Results from the screening device 30 are displayed to the user via the LCD 56 which also acts to prompt the user for the data required to operate the screening device. Power is supplied to the CPU 80, LEDs 44, LEDs 58 and 60, microswitch 43 and CCD 34 from the ~~a~~ rechargeable battery pack 48. The batteries can be recharged from the ~~mains~~ main electrical supply or, for example from a car cigarette lighter, via an adaptor. The operation of recharging the batteries can be controlled by the CPU or alternatively can be controlled manually. Preferably, the screening device automatically shuts down to preserve battery life if no cartridge is present or if the results of the previous screening have been displayed for longer than a preset time, say 5 minutes.

Preferably, if an external power supply is detected by the screening device the CPU 80 automatically commences a battery recharging program. Preferably, the batteries can hold enough charge to operate continuously for up to 24 hours without being recharged.

Please replace the paragraph beginning at page 14, line 20, with the following rewritten paragraph:

In the embodiment described above the overall size of the device is approximately 85mm by 80mm by 65mm and the device weighs approximately 300g. The test device is thus small, light weight, and portable. The CCD 34 may be, for example, a Connectix Quickcam, incorporating a CCD imager, video digitiser and video data interface.

Please replace the paragraph beginning at page 14, line 25, with the following rewritten paragraph:

Operation of the screening device will now be described. Disposable saliva test swabs 70 are stored in a sealed pack and one swab removed immediately prior to use. The swab should be removed from the pack by the person whose saliva is to be tested and is wiped under the tongue for approximately 15 seconds. The swab 70 is then inserted into the swab holder 16 of a disposable test cartridge 10. Ten drops of a run fluid, which may be of any conventional type, are added to the swab holder 16. The run fluid transports the sample of saliva from the test swab 70 to the absorbent pad 26 and onto the conjugate release pad 27, where the saliva and run fluid mixture mixes with the labelled (e.g. with gold, coloured latex particles carbon particles, fluorescents, or any other suitable label) anti-drug antibodies. The sample subsequently travels along the length of the nitro-cellulose membrane 24. At each test zone any unbound labelled drug antibodies are bound to the drug-protein derivative of the test zone. Any of the labelled antibodies which have not been bound to the test zones passes over the control zone where it becomes bound to

the control zone. The result is a number of lines of varying intensity spanning the width of the membrane at points along the length of the nitro-cellulose membrane corresponding to the drug-protein derivative test zones and the control zone. Each drug-protein derivative test zone can be used to detect a different drug. The higher the concentration of the particular drug in the saliva sample, the less intense the colour in that drug-protein derivative test zone.

Please replace the paragraph beginning at page 16, line 1, with the following rewritten paragraph:

As the test cartridge 10 is pushed into position it displaces the micro switch 43. A signal is sent from the microswitch 43 to the CPU 80 which activates the scanning process by down-loading a preset program from EEPROM 90. Timer means are provided to delay illumination of the immunoassay test strip until the test has had time to run. Once the presence of a test strip has been detected the CPU 80 commences initialisation by prompting the user to set a timer to alert the operator to wait a sufficient time for the sample to travel the length of the membrane. Alternatively the user may time the test manually and an on/off power switch can be provided which the user can operate once the assay test has been run and the test cartridge 10 has been inserted into the screening device 30. The timer function may be provided by a separate timer integrated circuit controlled by the CPU 80 or may alternatively be provided internally to the CPU 80. When the prerequisite length of time has elapsed, which is generally of the order of five minutes, the timer sends a signal to the CPU 80 which alerts the operator that the sample is ready for screening for example by flashing LEDs 58 and 60, displaying a message on LCD 56 or sounding an alarm. The screening device is also able to time the test, analyse results, output results and store the results automatically.

Please replace the paragraph beginning at page 18, line 3, with the following rewritten paragraph:

Light from the LED 44 shines onto the window 22 of the test cartridge 10 illuminating the nitro-cellulose membrane 24 visible through the window 22. The illuminated membrane 24 is reflected by the mirror 40 into the field of view of CCD 34. The image is digitised and outputted via a video data interface to the CPU 80 for data processing. Preferably, the digital data is stored to dynamic RAM 92 for subsequent processing.

Please replace the paragraph beginning at page 19, line 7, with the following rewritten paragraph:

Each membrane is therefore represented by an array of p x q pixels where the p pixels span the length of the membrane and the q pixels span the width of the membrane. The drug-protein derivatives are bonded across the entire width of the membrane at discrete intervals along the membrane. At any location (p,r) where p falls within a particular drug-protein derivative test zone the intensity of the pixel is related to the amount of that particular drug in the sample, regardless of the value of r in the range $0 \leq r \leq q$. The intensities of the pixels at (p,r) are therefore summed over the range $0 \leq r \leq q$ for each p.

Please replace the paragraph beginning at page 19, line 18, with the following rewritten paragraph:

Slight discrepancies between the theoretical position of the membrane and the actual position of the membrane may be accommodated by the screening device. The CPU 80 compares the summed intensity at a specific location corresponding to the theoretical centre position of the control zone with the intensity at a predetermined number of adjacent locations to determine whether there is any discrepancy between the theoretical location of the control zone with the actual location of the control zone. The CPU 80 applies a

corresponding offset to subsequent calculations if the theoretical and actual locations of the centre of the control zone differ. The offset must be determined by reference to the control zone because if any of the tests are positive then the intensity of that drug-derivative test zone will be correspondingly reduced.

Please replace the paragraph beginning at page 20, line 5, with the following rewritten paragraph:

Figure 6 shows a typical graph of the resulting pixel intensity against the location of the pixel for a single protein-drug derivative test zone and a single control, or reference, zone. Once any offset of the membrane from the theoretical position has been identified, the data is segmented according to whether it lies in a drug-protein derivative test zone, the control zone or in a space (i.e. a background zone) between adjacent zones as shown in Figure 6. Preferably, the CPU 80 is a Hitachi H8/3002 microprocessor chip but any other suitable microprocessor chip may be used. The CPU 80 segments the data into a first plurality of data corresponding to the control zone, a second plurality of data corresponding to the test zones, and a third plurality of data corresponding to the background zones. The CPU 80 then processes the first, second and third pluralities of data, performing the following calculations to determine whether each drug is present in the sample.

Please replace the paragraph beginning at page 21, line 2, with the following rewritten paragraph:

If REF≤0 then the reference, or control, zone has not bound any of the products present in the saliva sample and run fluid after it passed over the drug-protein derivative test zones. Either the control zone is faulty on the membrane or the assay test has not been completed correctly which may be due to an insufficient amount of run-fluid being added to the swab holder. The screening device will display an error

message and the cartridge should be removed, reinserted and reread or disposed of and another cartridge run. However, the delay for the test to be performed is not required in these circumstances and the operator is provided with a means for bypassing the timer operation to commence immediate image acquisition and data processing. If an error is still detected then the test must be re-run using a new cartridge and saliva sample.

Please replace the paragraph beginning at page 21, line 17, with the following rewritten paragraph:

If REF>0 showing that the assay test has been successfully completed but TEST≤0 then the drug concentration in the sample is such that all the antibody-gold conjugates have been bound to the drug in the sample. The results of that test is set to 100%. The test is assigned a qualitative level "Positive". A quantitative value would be represented as "greater than" a certain level.

Please replace the paragraph beginning at page 22, line 5, with the following rewritten paragraph:

The results for the concentration of each drug can be displayed in a number of ways. The LCD 56 may be used to display the name of the drug and its result. Alternatively only the fact that the test for that particular drug is positive may be displayed. If the display is to indicate a positive or negative result only then the CPU 80 must have access to a threshold for each drug which could be held in the EEPROM. For each drug if the detected concentration exceeds the threshold then the result would be positive and if the detected concentration falls below the threshold then the result would be negative. Each separate drug-protein test zone must be tested in this way with reference to the control zone to determine the concentration of that drug in the saliva sample.